**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT APPLICATION EXAMINING OPERATIONS**

Appl. No.   : 10/645,952   Confirmation No. 8258
Applicant   : Xiao-Fan Feng
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TC/A.U.   : 2625
Examiner   : Steven Y. Kau
Docket No.   : SLA1222
Customer No.   : 52894
Title   : SYSTEMS AND METHODS FOR DITHER STRUCTURE CREATION AND
                 APPLICATION

AMENDMENT and RESPONSE

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Mail Stop Amendments
Commissioner for Patents
P.O. Box 1450
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Dear Commissioner:

In response to the Office action of March 25, 2008, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the Listing of Claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 11 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (withdrawn) A method for creating a dither pattern, said method comprising:

   a. establishing an initial reference frameset (IRF), wherein said IRF comprises an initial pixel pattern;

   b. creating a dither pattern by orienting pixel values in said pattern by a method wherein pixel values are placed in a position that is dispersed from a position of pixel values in said initial pixel pattern and the position of pixel values in said dither pattern.

2. (withdrawn) A method according to claim 0 wherein said initial pixel pattern and said dither pattern are divided into multiple color channels.

3. (withdrawn) A method according to claim 0 wherein said dispersion from pixel values in said initial pixel pattern is weighted differently from dispersion from said pixel values in said dither pattern.

4. (withdrawn) A method according to claim 2 wherein said dispersion from pixel values in a first color channel is weighted differently from said dispersion from pixel values in another color channel.

5. (withdrawn) A method for creating a dither pattern for a multiple image

description channel image, said method comprising:

designating pixel values in a plurality of dither pattern tiles, each

of said tiles being allocated to an image description channel, wherein said

designating is performed using cross-channel feedback, such that

subsequently-designated pixel values are placed at a location that is related

to the location of previously-designated pixel values in the same image

description channel and related to the location of previously-designated

pixel values in other image description channels.

6. (withdrawn) A method according to claim 5 wherein said "related to the location"

comprises dispersion from the location.

7. (withdrawn) A method according to claim 5 wherein said "related to the location"

comprises dispersion from the location using an infinite impulse response

function.

8. (withdrawn) A method according to claim 5 wherein said relation to the location

of previously-designated pixels is channel specific such that pixel values in one

color channel will disperse differently than pixel values in another channel.

9. (withdrawn) A method according to claim 5 wherein said relation to the location

of previously-designated pixels is channel specific such that pixel values in color

channels other than the channel of the pixel being designated will disperse

differently than pixel values in the same channel.

10. (withdrawn) A method according to claim 5 wherein said image description

channels are color channels.

11. (withdrawn) A method according to claim 5 wherein said image description

channels comprise three channels for each of a red, green and blue color.

12. (withdrawn) A method according to claim 5 wherein pixel values in said channels

are designated in a sequence one channel at a time with cross-channel feedback

being used to designate pixel locations after a first channel is designated.

13. (withdrawn) A method according to claim 5 wherein pixel values in said channels

are designated in parallel with cross-channel dispersion feedback for each

channel.

14. (original) A method for creating a spatio-temporal array of dither patterns, said

method comprising:

    a. establishing a spatio-temporal array of dither pattern tiles comprising a

plurality of temporal framesets, each of said framesets comprising a

plurality of pattern tiles for each of a plurality of color channels; and

    b. designating pixel values in said dither pattern tiles wherein subsequently-

designated pixel values are spatially dispersed from previously-designated

pixel values in the same dither pattern tile and dither pattern tiles in other

color channels.

15. (original) A method according to claim 14 wherein said subsequently-designated

pixel values are also dispersed from previously-designated pixel values in other

temporal frames.

16. (original) A method according to claim 15 wherein said dispersion from pixel

values in other temporal frames is weighted wherein temporal frames more

temporally distant from a pixel value have a lower dispersion than closer temporal

frames.

17. (original) A method according to claim 15 wherein said dispersion from pixel

values in other color channels is weighted wherein other color channels have a

lower dispersion than the color channel in which a pixel value is designated.

18. (original) A method according to claim 15 wherein pixel values designated in a last temporal frame are considered temporally adjacent to a first-designated frame wherein said pixel values in said first-designated frame have a dispersion effect on pixels designated in said last frame.

19. (withdrawn) A method for creating a dither pattern, said method comprising:

   a. establishing an initial reference frameset (IRF), wherein said IRF comprises a dither pattern;

   b. designating, a first pixel value in a dither pattern for a first channel, wherein said first value is located at a position that is dispersed from the positions of pixel values in said pattern in said IRF;

   c. designating a second pixel value in said dither pattern for a first channel, wherein said second value is located at a position that is dispersed from the positions of pixel values in said dither pattern and in said IRF;

   d. repeating said designating in step c until all pixel values in said dither pattern for said first channel are designated;

   e. designating, a first pixel value in a dither pattern for a second channel, wherein said first value is located at a position that is dispersed from the positions of pixel values in said dither pattern for said first channel and in said IRF;

   f. designating a second pixel value in said dither pattern for a second channel, wherein said second value is located at a position that is dispersed from the positions of pixel values in said dither pattern for a second channel, pixel values in said dither pattern for a first channel and

dither patterns in said IRF;

    g.   repeating said designating in step f until all pixel values in said dither

pattern for said second channel are designated; and

    h.   repeating steps e through f for any other channels.

20. (original) A method for creating a spatio-temporal array of dither patterns, said

method comprising:

    a.   establishing an initial temporal offset frameset (ITOF), wherein said ITOF

comprises a pre-determined pattern for each of a plurality of color

channels;

    b.   establishing a first temporal frameset comprising dither pattern tiles for

each of a plurality of color channels;

    c.   designating a first pixel value at a first point in a first dither pattern tile of

said first temporal frameset, wherein said first point is dispersed from at

least one pixel value in said pre-determined pattern;

    d.   designating a second pixel value at a second point in said first dither

pattern tile of said first temporal frameset, wherein said second point is

placed at a location that is dispersed away from at least one pixel value in

said first dither pattern tile;

    e.   repeating step d until all pixel values in said first dither pattern tile of said

first temporal frameset have been designated;

    f.   designating a first pixel value at a first point in a second dither pattern tile

of said first temporal frame, wherein said first point is dispersed from at

least one pixel value in said first dither pattern tile;

g. designating a second pixel value at a second point in said second dither

   pattern tile of said first temporal frameset, wherein said second point is

   placed at a location that is dispersed away from at least one other pixel

   value in said first dither pattern tile;

h. repeating step g until all pixel values in said second dither pattern tile have

   been designated;

i. repeating steps f, g & h until all pixels in all dither pattern tiles in said first

   temporal frameset have been designated;

j. establishing a subsequent temporal frameset comprising dither pattern tiles

   for each of said plurality of color channels;

k. designating a first pixel value at a first point in a first dither pattern tile of

   said subsequent temporal frameset, wherein said first point is dispersed

   from at least one pixel value in said first temporal frameset;

l. designating a second pixel value at a second point in said first dither

   pattern tile of said subsequent temporal frameset, wherein said second

   point is placed at a location that is dispersed away from at least one pixel

   value in said subsequent temporal frameset, at least one pixel value in at

   least one prior frameset;

m. repeating step l until all pixel values in said first dither pattern tile of said

   subsequent temporal frameset have been designated;

n. designating a first pixel value at a first point in a second dither pattern tile

   of said subsequent temporal frame, wherein said first point is dispersed

   from at least one pixel value in said subsequent temporal frameset, at least

   one pixel value in a prior frameset;

    o. designating a second pixel value at a second point in said second dither

        pattern tile of said subsequent temporal frameset, wherein said second

        point is placed at a location that is dispersed away from at least one pixel

        value in said subsequent temporal frameset, at least one pixel value in a

        prior temporal frameset;

    p. repeating step o until all pixel values in said second dither pattern tile have

        been designated;

    q. repeating steps n, o & p until all pixels in all dither pattern tiles in said

        subsequent temporal frameset have been designated;

    r. repeating steps j-q for a plurality of framesets.

21. (currently amended) A system for creating a spatio-temporal array of dither patterns, said ~~method~~ system comprising:

    a.   a spatio-temporal array of dither pattern tiles comprising a plurality of temporal framesets, each of said framesets comprising a plurality of pattern tiles for each of a plurality of color channels; and

    b.   a designator for designating pixel values in said dither pattern tiles wherein subsequently-designated pixel values are spatially dispersed from previously-designated pixel values in the same dither pattern tile and dither pattern tiles in other color channels.

22. (currently amended) A computer-readable medium comprising computer-executable instructions encoded in a computer program for creating a spatio-temporal array of dither patterns, said method comprising:

    a.   establishing a spatio-temporal array of dither pattern tiles comprising a plurality of temporal framesets, each of said framesets comprising a plurality of pattern tiles for each of a plurality of color channels; and

    b.   designating pixel values in said dither pattern tiles wherein subsequently-designated pixel values are spatially dispersed from previously-designated pixel values in the same dither pattern tile and dither pattern tiles in other color channels.

REMARKS

The drawings are objected to under 37 CFR §1.83(a) for not showing every feature of the invention specified in the claims. The examiner states that the "designator for designating pixel values" is not shown in the drawings. The designator is a logical structure that may be implemented in software, hardware, firmware and other forms. It may take the form of a general purpose computer, a special purpose computer, a similar computing device or may be a software construct stored on media or in memory. Because the designator can be fully described in text, there is no need for a drawing. However, Figure 9 at 100 shows an exemplary designator. Applicant sees no need for additional drawings or corrections and respectfully requests the examiner to reconsider this objection.

Claim 21 has been rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 21 has been amended to correct the reference to a "method" in this system claim. The examiner has also underlined the term "designator …" in citing this rejection. The term "designator" is used to convey its ordinary meaning and is further described functionally by other elements in the claim. The designator of this claim may be implemented as a computer, television, computing device, filter, hardware, software or other implementations, however, the designator is qualified by the limitations that describe the way in which designator functions by dispersion of pixel values. Applicant believes the examiner has failed to consider the additional qualifications of this claim element in coming to the conclusion that this term does not distinctly claim the invention and requests reconsideration of this part of the rejection.

Claim 22 is rejected under 35 USC §101 because the claimed invention is directed to non-statutory subject matter.

Claim 22 is amended to more clearly show that the instructions are encoded in a computer program and are, therefore, statutory subject matter.

Claims 14-18 and 20-21 are rejected on the ground of non-statutory anticipated-type double patenting as being unpatentable over claim 18 of US Patent No. 7,352,373.

A terminal disclaimer is submitted herewith to overcome this rejection.

Claims 14-18, 21 and 22 are rejected under 35 US 103(a) as being unpatentable over US Patent No. 4,758, 893 to Lippel (hereinafter Lippel) in view of US Patent No. 6,851,783 to Gupta et al (hereinafter Gupta et al).

The rejection is improper as it fails to present a prima facie case of obviousness. The examiner is equating the spatial dispersion of the claims of the present invention with an error diffusion process disclosed in Gupta et al. These processes are very different. It should be noted that the term "dithering" refers to several different processes. Most importantly, dithering refers to 1)a process wherein the application of a pattern to an image to reduces the visibility of contouring or blocking artifacts (the present application) and 2) a process, referred to as halftoning, wherein an image of higher bit depth (e.g., 8 bit) is converted to a single-bit image and wherein shading in the original image is represented as patterns in the 1-bit image (Gupta et al.). The term "dithering" is, therefore, somewhat ambiguous unless qualified by other limitations that define to which context the term refers. In this case, the specification and the

presently rejected claims clearly show that the present application utilizes the former definition of dithering while the language in Gupta et al clearly shows that their use of dithering utilizes the latter definition.

Furthermore, the error diffusion disclosed by Gupta et al does not involve spatial dispersion, as described in the rejected claims.

The rejected claims describe a process or apparatus with an element equivalent to:

"designating pixel values in said dither pattern tiles wherein subsequently-designated pixel values are spatially dispersed from previously-designated pixel values in the same dither pattern tile and dither pattern tiles in other color channels."

This element describes, specifically, a process wherein dither pattern pixel values are spatially dispersed from previously-designated pixel values in the same dither pattern tile and corresponding tiles in other color channels. This claim element refers, significantly, to spatial dispersion from other pixel values in other color channels. Gupta et al teach an error diffusion method wherein color channel images (8 bit) are dithered (halftoned), or reduced in bit-depth, to 1-bit halftone outputs. These halftone color channels are also processed (e.g., Max(C,M,Y,K) to create a virtual color channel. Error diffusion is then used to process this virtual halftone color channel. This error diffused virtual halftone color channel image is then used to replace one of the halftone color channels in the output image. Gupta et al teach a halftoning process that modifies image pixel values directly and that does not create a *dither pattern tile* that can be applied to an image to reduce image artifacts.

A typical error diffusion process adjusts the values of neighboring pixels in response to an error between a processed target pixel value and a corresponding pixel value of an original

image. This process is not equivalent to spatial dispersion from previously-designated pixels

described in these claims and this process does not result in a dither pattern tile. Applicant

respectfully requests that the examiner reconsider this rejection.

In light of the above amendments and arguments, applicant requests that this application

be allowed in its current form.

Respectfully submitted,

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